

3-3 START UP

1. Use your calculator to evaluate the limits below:

(a) $\lim_{x \rightarrow 0} \frac{\sin x}{x}$ assuming x is in radians

(b) $\lim_{x \rightarrow 0} \frac{\sin x}{x}$ assuming x is in degrees

(c) $\lim_{x \rightarrow 0} \frac{\cos x - 1}{x}$ assuming x is in radians

2. You are going to establish the derivative of $f(x) = \sin x$.

(a) Start by applying the definition of the derivative to $f(x) = \sin x$. (The definition with the limit and the little h .)

(b) There is a trig identity: $\sin(a+b) = \sin a \cos b + \sin b \cos a$. Use this identity to rewrite the term $\sin(x+h)$.

(c) Collect the terms with $\sin x$ together and any terms with $\cos x$. Once you have done this, see if you can use the limits from part 1 to evaluate the limit and find the derivative of $\sin x$.

3. Does it matter whether you use degrees or radians to find the derivative of $f(x) = \sin x$?
4. For $f(x) = \sin x$, sketch $f(x)$ and $f'(x)$ on the same axes and check the “reasonableness” of your answer.
5. Use the fact that you know the derivative of $y = \sin x$ to find the derivative of $y = \csc x$.